

Listening to the Agricultural Sector

What challenges do farmers and practitioners face?



Agricultural Resilience Impact & Innovation Hub

In AGRIIH's ongoing survey, stakeholders ranked their top five challenges from a list of ten, shown below with numbered stars.

1★ Water availability and climate-related stressors

Market and trade access volatility

Supply chain and logistics disruptions

Labour and workforce capacity issues

4★ Policy and regulatory uncertainty

3★ Environmental, biodiversity, and sustainability compliance pressures

2★ Economic pressures and cost volatility

Technology access, suitability, and uptake

Changing consumer demands and expectations

5★ Agricultural conditions (e.g. soil, animal welfare, pest & disease outbreaks)

Vote for the challenge that matters most to you using the sticky dots

Which challenge matters most to you?

Stakeholders also told us

"Agriculture is complex - it needs joined-up thinking."

"We need research that works on our farms, not just in labs."

"When it doesn't rain for months, it's not just the crops - it's our income drying up too."

"You can't plan for next season when the weather keeps rewriting the rules."

Farmers and practitioners highlighted similar core challenges - and they're calling for research that translates into action: *practical, relevant, and rooted in real-world agriculture.*

What does Agricultural Resilience Mean to You?

Researchers say

"Resilience isn't about bouncing back - it's about finding a way forward."

"Agricultural Resilience sits across systems - ecological, social, and economic - we need to consider the interactions between these systems, not address them separately."

Stakeholders say

"Resilience starts with keeping the farm running when the weather doesn't."

"Diversity is important, but you also need to be good at your main thing - that's how you stay resilient."

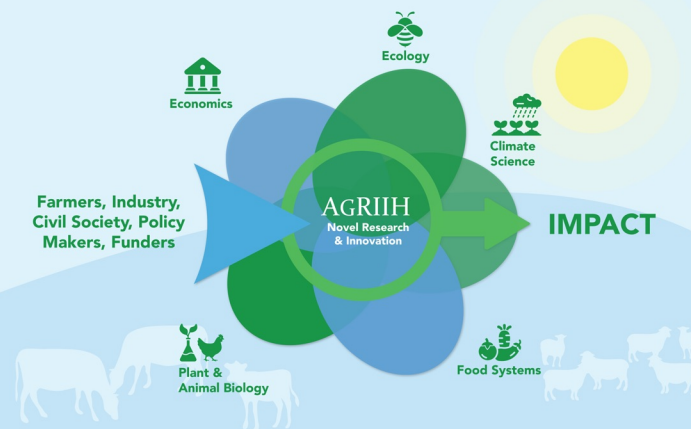
"We must learn to adapt before you have to."

adaptability
ecological health
diversification
handling long-term challenges
coping with short term crises & shocks
reducing vulnerabilities
robustness
stability
transformative
recovery
fair systems

These terms reflect how interdisciplinary researchers described agricultural resilience at a recent workshop.

Larger words reveal those most strongly shared by stakeholders - based on early results from our ongoing stakeholder survey

From Insights to Action



The Showcase is a starting point for dialogue - connecting knowledge from lab to farm to build a more resilient future for agriculture.

We are sharing examples of Oxford's research - and would love your input on where collaboration could make the biggest difference.

How can we work with you to co-create research and innovation with real-world impact?

Showcase Themes

Working with Nature for Resilient Farming

1

Technology and Innovation

2

Healthy People, Healthy Planet

3

Who Shapes the Future of Agriculture?

4

Co-creating Resilient Futures

5

Life Beneath Your Boots

Healthy, biodiverse soils are the backbone of resilient farms.

Mob-grazing has been posited as a way to restore ecosystem functionality. Studying sheep- and cattle-grazed systems, we are testing whether grazing approaches with longer rest periods support richer earthworm and microbial communities, boosting nutrient cycling.



Mesocosm experiments with **earthworms** show they remain **effective decomposers** even during **droughts and floods**, making them potentially valuable allies as extreme weather becomes more common.

Ongoing research in arable fields, suggests that **herbal ley regimes** show **greater soil function and biological complexity** than conventional winter wheat, with better water infiltration and nutrient retention.

Aligning Nature-Friendly Farming With Global Goals

Our research has also explored the important role for agriculture and wider land-management in meeting climate targets. **Agricultural sustainability is an essential component of net-zero**, by reducing agricultural greenhouse gas emissions and securing habitat carbon storage.

Setting targets tailored specifically to agriculture, recognising the different requirements and outcomes compared to fossil fuels, provides a more accurate and fair way to track progress while supporting both productive and nature-positive farming.

Where do you feel nature already helps your farm - and what could be done to enhance the benefits?

Working with Nature for Resilient Farming

The Tiny Creatures That Shape Our Farms

Insects are some of our most important allies and most challenging pests. Understanding these small but mighty creatures can help us maximise the benefits and minimise the costs.



Research into how bees judge food quality and learn flower cues is informing **ways to improve pollination** in soft fruits and vegetables.



Our work on **aphids and their symbiotic bacteria** is shedding light on natural resistance to parasites, insight that can enable the development of more effective **biological control**.

Working With Nature's Complexity

Farming systems that better reflect natural diversity and complexity are proving more resilient.

We are studying how farm ecosystems function. Early results indicate that **regenerative and rewilded pastures support higher biodiversity and structural complexity** compared to conventional practices. System complexity is linked to better resilience to climate stresses.

Cacao agroforestry in Ecuador



Pan-tropical agroforestry research is revealing optimal diversity and density of shade trees for stabilising yields, supporting wildlife and strengthening climate resilience. **Translating lessons from the tropics**, we are developing an ambitious new programme to test **temperate multi-crop systems** across Europe under different climate scenarios.



Temperate silvoarable

Farmers are adopting more nature-friendly practices, but we have found that current tools don't always capture their impact. **Standard lifecycle assessments have limitations in the context of regenerative agriculture** because they are not very good at reflecting multi-functionality or detecting impacts over longer timeframes.



Research groups: CERO, NbSI, LCNr, Agile, Bee Lab

Tools for Smarter, Nature-Positive Decisions

We are developing new digital tools and monitoring technologies that are helping farmers and decision makers plan and improve agriculture at field and landscape scales.

The Nature-based Solutions Knowledge Hub is an integrated one-stop resource to guide users through the process of governance, designing and funding Nature-based Solutions in the UK.



HESTIA

HESTIA is a free database that standardises data on farm practices and environmental impacts, enabling users to **quantify and compare footprints across production systems**. It reports metrics such as global warming potential, water use, land use and ecotoxicity.

What information would help you make better decisions on your farm?

We are developing scalable, cost effective **AI methods for ecoacoustic data analytics** that make sense of the whole soundscape, effectively separating and identifying sounds such as birds, weather, and machinery.

Demographic modelling is revealing how species respond to climate extremes and habitat loss, helping identify management approaches that sustain productivity and biodiversity. New monitoring tools - such as **drones and autonomous robots** - are providing scalable ways to track ecological change.

Research groups: Salgo Lab, Bolla Lab, Jarvis Lab, Ostergaard Lab, Preston Lab, Dawkins Lab, Bee Lab, Tanner Lab, NbSI, Agile, ICCS, OMS, LCNR



Technology and Innovation

Innovation for Healthy Farm Animals

From our largest to smallest domestic animals, research is advancing health and welfare.

In the UK, bovine TB results in the culling of tens of thousands of cows every year. Vaccination could prevent infections and limit disease spread. **We have developed bovine immune organoids** (an 'immune system in a dish') to test vaccines in a **rapid, ethical and cost-effective way**.



OpticFlock is a camera-based system that continuously monitors chicken welfare by analysing flock movement patterns. It can detect **early signs of problems such as lameness, and can even identify flocks at risk of Campylobacter** infection long before standard tests detect the bacteria.



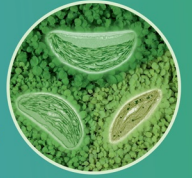
Climate change and intensive farming are reducing pollen availability for honeybees. Research into bee nutrition has led to a **new pollen substitute that significantly boosts colony reproduction**.



Harnessing Plant Power for Future-proof Crops

Understanding how plants work at the molecular level gives us insights to develop new crop varieties and harness under-utilised species for our changing climate.

Studying **chloroplasts, the engines of photosynthesis**, can provide insights for crop performance under climate stress. For example, we're developing "stay-green" wheat that **maintains photosynthesis longer for better yields and stress tolerance**, now in field trials.



Differing chloroplast development across three genotypes of *Arabidopsis thaliana*

Less domesticated legumes could have important climate resilience traits but are often lacking in other aspects of crop performance. Understanding how genes and hormones work together to coordinate pod and seed development is generating **insights to improve under-utilised species** through gene-editing and advanced phenotyping technologies.



Bioluminescence imaging of halo blight infection in common bean pods

Environmental factors like **heat and high soil nitrogen can weaken crop disease resistance**. We study how these conditions influence plant diseases to support the development of more resilient crops and farming systems, including novel and under-used species that could play a growing role in future food security.

How Our Diets Shape Farms and the Planet

What ends up on our plates depends on both farming and food choice - and our choices strongly influence demand for land, water and farm inputs. Our research shows that diets with more plant-based foods tend to have much smaller environmental footprints and can support healthier outcomes at the same time.

Shifting diets in high-income countries could **free up land equal to the size of Europe** and remove more than a decade of global agricultural emissions.

These shifts also steer attention toward crops that can **meet nutrition needs with lower impacts**.



Humble Beans That Carry Great Weight

Legumes earn their place in UK crop rotations by fixing nitrogen and improving soil health. They are also **nutrient-rich, low-impact foods** that people in the UK already enjoy - from baked beans to dals - yet **few of the beans eaten here are grown here due to climate conditions**.

For more UK-grown beans to reach people's plates, **growers need varieties suited to the UK climate, and rotations that fit their farming system** - but they also need the wider system to line up.



Working with common beans grown in the UK, **BeanMeals** highlights gaps in processing capacity, contracting and procurement, as well as the need for broader systemic innovations - from retail offerings to consumer expectations. **These insights point to new market opportunities and more resilient supply chains.**

Healthy People, Healthy Planet

One Health: The Hidden Links Between Animals, Food and Us

Animal health and welfare shape food safety all along the supply chain. Oxford researchers are tracing how foodborne bacteria move from farm to fork to understand where risks arise.



We are currently investigating the significant rise in human *Campylobacteriosis* cases in 2024 and the **persistence of highly antibiotic-resistant variants despite reduced antibiotic use on farms.**

DNA-based tracing approaches are revealing where these strains appear in supply chains and how they spread.



The health of animals, people and ecosystems is intertwined - and protecting one depends on understanding them all.

Understanding the Impacts of Agricultural Practices Beyond the Farm Gate

Farms across all systems can perform well when welfare, inputs and land use are carefully managed.

While many environmental impacts of farming are visible on the ground, they're often hard to compare across farms and supply chains - and even harder to understand without consistent data.

HESTIA are testing whether giving farmers clear, consistent impact data can support more confident decisions and real improvements on the ground via large-scale trials.

Safeguarding Precious Freshwater

Sensitive river insects show declines as the proportion of agricultural cover increases in the landscape. Research currently underway, is investigating what happens when nutrient runoff interacts with climate warming in freshwater ecosystems.

Citizen science approaches allow farmers to support data collection with on-farm monitoring of water bodies to detect early warning signals.



Freshwater biodiversity experiments

Farm Performance Depends on Contexts, Not Labels



Vertical farming illustrates that even innovative systems perform differently depending on energy, infrastructure and climate.

Seeing impacts clearly helps us understand the levers that matter most.

Research groups: Food Systems Transformation Group, Behrens Group, Table, Environment and Health Group, Sustainable Healthy Food Group, Dawkins Lab, Maiden Lab, HESTIA, Jackson Lab, Systems Engineering Group.

Different Futures Need Different Kinds of Resilience

- resilience of what, to what, for whom, and for how long?

"Regenerative Agriculture" means different things to different people in the UK. For some it is about soils and biodiversity; for others it is linked to carbon markets, diet change or new food labels.



Work from *Reckoning with Regen* reveals where these visions diverge, where evidence is missing, and why the term risks being stretched beyond its value.

Why Evidence Alone Can't Settle The Debate

People use the same scientific evidence to justify opposing conclusions - because values, assumptions and lived experience shape what they see in it.



Eating less meat reduces emissions and improves population health.



We should shift diets to reduce emissions.



Meat is nutritious and part of cultural identity - we should focus on farming efficiency instead.

Debates like these shape how change unfolds. Because people hold different ideas about what farming should deliver - for livelihoods, for health, for culture and for the environment. **Making these differences visible is key to finding directions** that are workable across the UK's diverse farming landscapes.

Who Shapes The Future of Agriculture?

The Economic Forces Behind the Agri-food System

Our research shows that **shifts in food production create early signals in financial systems**, influencing investor risk and supply-chain decisions before changes appear on the ground. Detailed UK environmental data can support sustainability reporting **without adding burdens for farmers.**

The FoodCost project is revealing the environmental, health and social costs embedded in different foods - the **"hidden bills" not reflected in market prices**. These models help identify where taxes, subsidies or procurement could better align economic incentives with public-good outcomes.

82%

Our work shows that in the EU, around 82% of farm subsidies are embodied in animal-sourced foods - a reminder of how diets shape the incentives behind whole farming systems.



Farming in a Connected World

Farming communities all over the world are experimenting with new ways to adapt to climate and market pressures - offering perspectives that can spark fresh thinking for the UK context.

The *Regenerative Economy and Living Library* (RELL) is developing **case studies of regenerative futures for agriculture**. Beginning with tea, the research asks what the industry's future could look like, whether it creates intergenerational benefits, and how quality and sustainable production can improve market value. The team aims to build a **global case study library** and welcomes UK producers interested in exploring how their industry could shift toward a more regenerative future for people and the planet.



Our international *Foresight4Food* work brings together farmers, businesses, governments and civil society to explore how climate, market and policy trends could reshape food systems.

Findings show that shared scenarios help actors spot emerging risks and blind-spots earlier, supporting longer-term and more strategic decision-making.

Looking ahead, which forces feel most influential in shaping the future of your farm?

This kind of collaborative thinking opens space for innovation - useful for any region navigating an uncertain future.

Research groups: Table, Oxford Sustainable Finance Group, Regeneration lab, Food Systems Transformation group, Foresight4Food

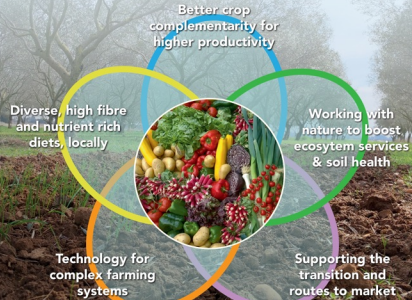
Bringing It All Together

Throughout this Showcase, we've followed how Oxford's research aims to connect with real-world agriculture - from the challenges to the collaborations driving change.

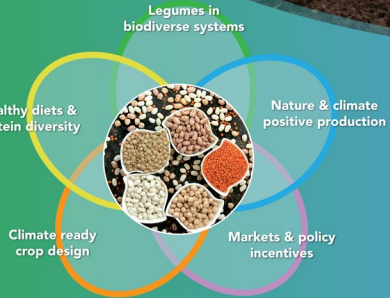
We have two planned workshops for 2026 which will bring scientists and stakeholders together around topics that link across themes.

WORKSHOP 1

Investigating ways to enhance productivity through multicrop-systems, for food security, resilient livelihoods and biodiversity recovery



Healthy diets & protein diversity



WORKSHOP 2

Exploring how legume crops can connect healthy soils, diverse ecosystems, and sustainable food futures

Through these workshops we aim to co-create research ideas for funding applications.

This is just the beginning - across Oxford, many more connections are taking shape.

Working with Oxford: Diverse Perspectives to Turn Ideas into Action

Across Oxford, agriculture and resilience research spans an extraordinary range - from molecules to markets, from ecosystems to politics.

This breadth opens new possibilities for collaboration and innovation - connecting ideas that can turn complex challenges into real change.



AGRIIH takes an interdisciplinary, systems-thinking approach - linking research and practice to understand how agriculture functions within the wider context.

We look forward to innovating together with you.

Get Involved: Building the Next Phase Together

We're building the next phase of AGRIIH through practical partnerships.

The next steps

Tell us which you'd like to be part of, or where your work connects with ours.

- Focused workshops
- Co-designed projects
- Joint funding bids

Your input will help shape future AGRIIH activities — and identify opportunities for partnership and funding.

Ways you can engage

- 💡 Idea co-creation
- 🌞 Providing field sites
- 👤 Informing the research process
- 🔄 Helping translate research to practical guidance, tools, and innovations
- 🌐 Real-world insights

Thank you for being part of this Showcase - and for helping us take these ideas forward.

Scan to share your interests and stay connected. You will have the option to take part in our stakeholder survey and receive collaboration opportunities.



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